

# Fungus Fatal to Mosquito May Aid Global War on Malaria

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In a finding that may open promising new ways to attack malaria, scientists are reporting today that two fungi that are harmless to humans and the environment can be used to kill mosquitoes.

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A freshly fed mosquito, top; one 12 hours after being killed by a fungus, center; and one 24 hours after being killed by the fungus.

The fungi are already licensed in Western countries to control aphids, termites and other pests, according to two studies in the journal *Science*. One of the researchers, Dr. Matt B. Thomas, a biologist at Imperial College in London, estimated that a "deliverable product" could be ready in three to five years, if he could get money for further research.

Malaria kills more than one million people a year, mostly children under 5 and pregnant women, especially

in Africa. Despite the advent of new drugs and better mosquito nets, some specialists say deaths may be increasing, largely because of bureaucratic delays among donors and breakdowns in African public health systems.

Moreover, mosquitoes eventually develop resistance to every chemical pesticide used on them, including DDT. No resistance to fatal fungi has been reported among agricultural pests, Dr. Thomas said.

Scientists not connected with the new research called the

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findings encouraging.

"We're constantly begging industry to develop new ways to treat bed nets," said Dr. Allan Schapira, policy coordinator for the World Health Organization's Roll Back Malaria program. He said he had not seen the studies but "if it works, that's great."

Dr. Kent Campbell, a former chief of the malaria branch at the Centers for Disease Control and Prevention in Atlanta, said, "I'd like to see a lot more research, but this is fascinating."

Dr. Yeya Touré, chief of insect research for the World Health Organization's malaria branch, called the studies "quite promising," but added that he wanted to see more tests of safety and effectiveness - in particular, how long the fungi would remain lethal when sprayed on walls or soaked into mosquito nets.

In the first study being reported today, scientists from Imperial College and the University of Edinburgh sprayed oil containing *Beauveria bassiana* fungus into cardboard pots. Mosquitoes that had taken blood meals were put into the pots for six hours, about the minimum time that they usually rest on a sprayed wall to digest before flying outside to lay eggs.

Many mosquitoes died within 14 days, which is crucial because it takes the malaria parasite about that long to move from the mosquito's abdomen into its saliva so it can be transmitted.

Also, survivors seemed to fly poorly and bite less, and the parasites in them seemed to develop more slowly, the study said.

That team picked *Beauveria bassiana* because it has already been approved by Western environmental agencies for aphids and whiteflies on melon and tomato crops, Dr. Thomas said, so there is abundant evidence that it is relatively safe for humans.

Human bodies are too warm for it to grow in, he added.

Bug-killing fungi have been known since 1835, when the entomologist Agostino Bassi realized that the muscardine disease then turning legions of Italy's silkworms into white mummies was caused by a fungus that could penetrate their shells. The fungus, which grows in soil all over the world,

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was later named for him.

In the second study, scientists from Wageningen University in the Netherlands and the Ifakara Health Research Center in Tanzania hung black cotton sheets smeared with the *Metarhizium anisopliae* fungus in five huts in a Tanzanian village while clean black sheets were hung in five control huts.

Mosquitoes were collected alive for three weeks. About 23 percent of those caught in the huts with fungus sheets had fungus infections, and they typically died in less than four days, compared with more than nine days for fungus-free mosquitoes.

Since mosquitoes normally bite several times before they die, the fungus reduced potential malaria transmission by 75 percent, said Dr. Bart G. J. Knols, a Wageningen University entomologist.

But the lethality of the spores slowly faded, so spraying would have to be done monthly, which is not very practical in rural Africa, Dr. Knols said.

Still, another researcher, Kija Nghabi of Tanzania, noted that the cloth was impregnated with fungus "using very crude tools."

With machine-impregnated cloth and more virulent fungus strains, the results would probably improve, he said.

The *Metarhizium* fungus is sold as Green Muscle for locusts in South Africa and as BioBlast for termite control in the United States. The Environmental Protection Agency says it is harmless to humans even if swallowed or inhaled.

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